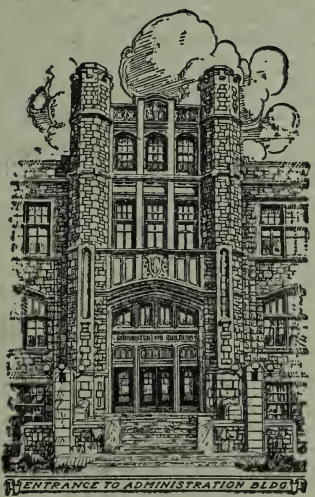
BULLETIN

CENTRAL MISSOURI
STATE TEACHERS COLLEGE

EXPERIMENTAL WORK
***in the* TRAINING SCHOOL**



WARRENSBURG, MISSOURI
DECEMBER, 1920

VOL. XXI DECEMBER, 1920 NUMBER 2

BULLETIN

Central Missouri State Teachers College

Established by an Act of the General Assembly,
1871, Organized May 10, 1871—Name changed to
Central Missouri State Teachers College
by the General Assembly of 1919

EXPERIMENTAL WORK *in the* TRAINING SCHOOL

Published by
THE CENTRAL MISSOURI STATE TEACHERS COLLEGE
ISSUED QUARTERLY

Entered at the Postoffice in Warrensburg, Mo., as Second Class Mail Matter

FOREWORD.

The work here presented has been prepared by pupils in the Training School, under the direction of Mr. George R. Crissman, Superintendent of the school, and Miss Eleanor Harris, Associate in Mathematics and Supervisor of the teaching of Mathematics.

Mr. Crissman gives special attention to experimentation in school problems and Miss Harris has been especially interested in the construction and use of graphs.

The illustrations given are selected from a large number and could be multiplied indefinitely. I hope they may prove a stimulus to many teachers in many ways.

E. L. HENDRICKS,
President.

SOME EDUCATIONAL PROBLEMS BEING INVESTIGATED.

Following will be found some live questions upon which every teacher must have judgment, and about which there is much being said and written. The investigations given are quite limited and mostly nontechnical in character but it will be granted that the conclusions reached are based upon evidence quite deserving of consideration.

The Training School is investigating a number of other questions among which may be named; 1. What is the effect of periodical and book reading upon the child's vocabulary? 2. What is the correlation between the student's I. Q. (intelligence quotient) and his scholarship record? 3. What reliance can be placed on the student's I. Q. as a basis for annual promotion? 4. What subjects in the High School curriculum function most in the post-school life? 5. Supervision and criticism vs. formal instruction in teaching penmanship. 6. The value of story telling in History, Reading and English. 7. How to make a social and industrial survey of your community.

The purpose is to take such questions and give them such a treatment as will enable many of the teachers and supervising officers of the state to gather evidence supplementary to that supplied by us. It makes any teacher a better teacher to have an educational problem to work upon and it takes away the killing monotony of her work.

We earnestly invite the cooperation of all. Write to us if you are interested.

It is believed that some of these problems will prove of sufficient value and interest to justify their being read and discussed before your schools.

GEORGE R. CRISSMAN, A. M.
Supt. of Training School.

HOW BUILD GOOD SPEECH HABITS?

First Problem.—In English classes is it best to permit *no incorrect word or sentence to pass uncorrected?* Are fluency, originality and spontaneity affected by such a policy? Is the habit of using good English materially helped by such a policy?

English authorities on methods disagree as to the answers to these questions. One theory is, that all other aims of the recitation are sidetracked by such a policy and that this is unnecessary since the building of good speech-habits can be secured just as effectively without using such a radical method. The other theory is exactly the contrary. Which theory is correct?

Method of Investigation and Results.—A teacher especially capable of detecting bad English was required to spend thirty-two hours inspecting four classes as described hereafter. The four English teachers of these classes were told of the investigation but were prohibited from telling their children. Two teachers were instructed to follow the *first theory*, correcting only a part of the errors each day, and leaving the remainder for furture recitations. The other two teachers were instructed to follow the second theory, *permitting no incorrect word or sentence to pass unchallenged* regardless of the effects upon the other aims of the lessons. All four teachers were instructed to emphasize the building of correct speech-habits. The period of trial was three months.

The inspecting teacher was not to visit the English recitations but to visit these same classes while they recited Geography. This was to see if the English teaching carried over to the other school work. The inspecting teacher kept her problem to herself, letting neither the Geography teacher nor pupils know. She was instructed to visit each class eight times, four at the beginning of the term and four at the close, making exact notations of the number and character of the errors in oral English.

The pupils of the two Geography classes whose English teachers followed theory number one made 53 errors during the first four visits and 38 during the last four visits, showing an inprovement of 29 per cent during the term; while the pupils of the other two Geography classes whose English teachers followed theory number two, (correcting *all* errors) made 34 errors during the first four visits and 18 during the last four, making an improvement of 48 per cent.

The improvement in both cases was unusual but this may be accounted for by the instructions given to all four English teachers to "emphasize the question of correct oral English." The smaller number of errors made by the last two classes is probably due to the fact that the radical plan of "correcting *all* bad English" had the effect of making these pupils more conscious of their speech defects from the very first.

As to the effect on the "fluency, originality and spontaneity" of the pupils the testimony of both the Supervisors and the two teachers agree that during the first two or three weeks the children were intimidated and a few even seemed resentful, but thereafter they talked just as freely, seemed to take a pride in their growing ability to recognize and use good English and, further, clearer and more discriminating thought and speech were secured.

While this investigation was too limited to be considered conclusive the evidence indicates that the second theory is decidedly preferable.

THE USE OF MOVING PICTURES.

Second Problem.—To determine some of the values of moving pictures, especially emphasizing moral questions and making a comparison with Sundy School and church work.

Method of Investigation and Results.—The questionaire indicated below was given to the summer school students of the Training School in grades 6 to 12. The answers were all written and their significance is perfectly obvious. They are summarized as briefly as possible.

Q. 1. About how often each month do you attend picture shows.

Number who never attend	12
Number attending approximately once per month	8
Number attending approximately twice per month	5
Number attending approximately three times per month	6
Number attending approximately four times per month	18
Number attending more than four times per month	40

Q. 2. Write the last names of all Movie Actors or Actresses whom you know and the kinds of plays in which they act.

Note: Remember all through these remaining questions that there were 12 children who never attend picture shows. These always appear in one of the gourps under each question.

Number who knew one	5
Number who knew two	14
Number who knew three	5
Number who knew four	7
Number who knew more than four	47

Q. 3. What is the Pathe Weekly?

Number who did not know (see note above)	32
Number who knew	59

Q. 4. If you had opportunity to attend either a religious picture show or a religious meeting Sunday night, which would you prefer?

Number preferring the show	58
Number preferring the meeting	33

Q, 5. Name some picture show which you attended last summer (twelve months past.)

Number not able to name such show (see note above)	19
Number able to name such show	72

Q. 6. Tell something about one show you attended.

Number unable to tell (see note above) 22
Number able to tell 69

Q. 7. Do you recall any special sermon or Sunday School lesson of last summer. (twelve months past.)

Number unable to tell about either 47
Number able to tell about at least one 44

Q. 8. Name people who wrote part of the Bible; tell something he wrote.

Number who could name no one 15
Number who could name only one 5
Number who could name only two 4
Number who could name only three 6
Number who could name only four 13
Number who could name more than four 31

Q. 9. Of what value do you think pictures shows are? Answers were interpreted.

Number who think they have no value (see note) 8
Number who do not have an opinion 15
Number who think they aid the memory 4
Number who think they have religious value 1
Number who think they have educational value 63
Number who think they teach current events 10
Number who think they have only entertainment value 20

Q. 10. Are picture shows mostly good or bad?

Number who had no opinion 8
Number who believed them mostly bad 17
Number who believed them mostly good 66

Q. 11. Do you think more people attend picture shows than Sunday school and church?

Number who think more go to Sunday School and church .. 25
Number who think more go to picture shows 66

CHILDREN'S CHARACTERIZATION OF THE BEST TEACHER.

Third Problem.—What are the children's ideas of what constitutes the most helpful teacher?

Method of Investigation and Results.—Two questions were asked and the children of grades 6 to 12 were asked to write five minutes on them.

First Question:—Think of the best teacher you ever had and tell in what way or ways this teacher was especially helpful. The answers were interpreted and classified as follows:

Forty seven told how their ideal teacher helped them in their studies.

Eleven were taught to concentrate.

Seven got their greatest help by the example set by teacher.

Twelve were discouraged and the teacher gave them new courage.

Three were helped by having good reading suggested.

Thirty-four were helped most by the clear explanation made by the teacher.

Twenty three were made to like school because the teacher made the work interesting.

Second Question:—Do you recall any special act or word of this teacher which greatly helped you? The following were the most characteristic. "Don't cry, I will help you." "Do not stop at the first trial." "Try, try, again." "Do not work too long on this one problem." "You are getting along nicely for the time you have been in school." "Never give up while there is a chance." "You are handing in neat papers." "If you want a grade, get your lessons." "Try to break your own record." "You can do it if you try hard enough." "If you did well to-day you can do better to-morrow." "A hint to the wise is sufficient." "That task was well done." "Work to a knife line." "You explained that excerise very well indeed." "Keep happy, no matter how hard your work may be."

Third Question:—What particular personal quality characterized your ideal teacher?

Sixty-five gave kindness. Six, patience. Five, politeness. Twenty seven, neatness. Thirty two, cheerfulness. Eighteen, pleasant voice. Nineteen, firmness. Six, thoughtfulness. Eight, impartiality. Eleven beauty.

HIGH SCHOOL WORK OF RURAL AND TOWN SCHOOL, CHILDREN COMPARED.

Fourth Problem.—Who makes the better record in the High School the graduates of the eighth grade in town schools or the rural school graduates? In what subject or subjects does each excel?

Method of Investigation and Results.—The total scholarship records of 178 pupils were compiled. This included two graduating classes and the present 11th and 12th grades of the Training School. Forty-five of these came from the rural schools and one hundred thirty-three came from the grade schools.

The av. H.S. scholarship record of city school pupils was..... 77
The av. H. S. scholarship record of rural school pupils was..... 81.2
The av. H. S. scholarship record of city pupils in English..... 79
The av. H. S. scholarship record of rural pupils in English..... 82.4
The av. H. S. scholarship record of city pupils in Mathematics. 74.9
The av. H. S. scholarship record of rural pupils in Mathematics 80.5
The av. H. S. scholarship record of city pupils in History..... 79

The av. H. S. scholarship record of rural pupils in History..... 81.3
The av. H. S. scholarship record of city pupils in Science..... 81.5
The av. H. S. scholarship record of rural pupils in Science..... 82.4
The av. H. S. scholarship record of city pupils in Latin..... 82.6
The av. H. S. scholarship record of rural pupils in Latin..... 75
The av. H. S. scholarship record of city pupils in German & F.. 82.2
The av. H. S. scholarship record of rural pupils in German & F.. 75
The av. H. S. scholarship record of city pupils in Technical Subj. 82.4
The av. H. S. scholarship record of rural pupils in Technical Subj. 84.2

Note: Too much must not be deduced from these results as the rural school pupils are more of a select group than are the graduates of the eighth grade in the town schools. A larger per cent of the latter go to the High School.

THE VOCABULARIES OF HIGH SCHOOL STUDENTS.

Fifth Problem.—What is the effect upon children's vocabularies of 1. The study of Etymology or Word Analysis? 2. The study of Latin? 3. Being reared in a family where the mother had a High School or College education?

Method of Investigation and Results.—A. standard vocabulary test was given to the students from 14 to 19 years old. At the same time each child was required to state 1. Whether or not he had taken the course in Word Analysis offered in the freshman year of the Training School High School. 2. Whether he had had as much as one year of Latin. 3. Had the mother had a High School or College education.

The results showed regarding the study of Word Analysis, that 25 had taken the course and 21 had not. The average vocabulary of the 25 was 990 words greater than that of the 21.

Regarding those who studied Latin; 6 had studied it and 43 had not. The average vocabulary of the 6 was 900 greater than that of the 43.

Regarding the effect of the mother's education; 21 of the mothers had had a High School or College education and 26 had not. The average vocabulary of the first group was 1260 words greater than that of the second group.

SCHOOL VIRTUES AND BUSINESS VIRTUES.

Sixth Problem.—The correlation of habits of tardiness and irregularity with grades and scholarship?

Method of Investigation and Results.—The total scholarship records of all pupils in the Training School above the third grade were compiled. All these pupils were also graded in promptness,

regularity and attendance. All grades below 70 were ranked IV. All between 70 and 80 were ranked III, all between 80 and 95 were ranked II and all above 95 were I. Then the pupils were all placed in ranks I, II, III or IV, both as to scholarship and regularity, etc.

Here are the results:

Attendance, Promptness, } Etc. . . . These same pupils in scholarship.

113 ranked I, 24 ranked I, 81 ranked II, 7 ranked III, 1 ranked IV.
44 ranked II, 4 ranked I 9 ranked II, 11 ranked III, 0 ranked IV.
26 ranked III, 0 ranked I, 13 ranked II, 13 ranked III, 0 ranked IV.
55 ranked IV, ranked I, 13 ranked II, 34 ranked III, 5 ranked IV.

Discussion:—A little calculation with the above figures gives the following *percentages* of *probability* which parents should consider seriously before permitting children to be irregular in attendance or tardy at school. Other determining factors are not here considered.

If a child ranks high (I) in attendance, promptness etc., he is three times as sure of making high grades (I or II) in scholarship as if he ranked low (IV). Conversely, if he ranks low in attendance (IV), he is ten times as sure of making a failure (IV) in his school work as if he ranked high (I.)

In other words the irregular, tardy child has a "1 to 3" chance of making a good grade in school and a "10 to 1" chance of making a failure.

School is the student's business establishment. The student who is willing to treat his school obligations lightly will almost certainly treat any other obligation lightly. Parents, themselves, little realize how the child's school habits carry over into the whole life after school. "Train up a child in the way he should go; and when he is old, he will not depart from it." The very fact that a child or parent regards school obligations lightly is almost certain evidence that school work is undervalued and this in turn means carelessness and low grade work.

Why does the business world regard tardiness and irregularity as unpardonable sins? Could not the tardy employee make up the 10 minutes he was late? Certainly, but it shows his attitude toward his job—his undervaluation of his work—therefore he is not wanted.

Why should the teacher, the parent and the pupil regard these virtues the same as the business man? Because they have the same significance in school as in business.

Moral:—The habitually irregular or tardy child has a "1 to 3" chance of making a good grade in school and a "10 to 1" chance of making a failure.

WHAT A HEALTH EXAMINATION OF YOUR SHOOL WOULD SHOW.

Seventh Problem.—To ascertain the health conditions in our schools.

Method of Investigation and Results.—In the Training School last summer a thorough but free medical examination was provided. The local physicians and dentists gave free service. Examination was offered to 161 children above the fifth grade, seventy of whom accepted the offer. While this problem deals with this seventy it is the opinion of the faculty that the 91 who refused the free examination needed it more than those who took it.

Of the seventy examined, forty-five had decayed or unhealthy teeth; twenty-five had enlarged or infected tonsils; twenty-three had abnormal or unhealthy noses; nineteen had unhealthy eyelids while *three* had trachoma; twelve had defective eyesight; twelve had unhealthy mouths and throats; ten had defective hearing; eight were mouth breathers; and seven had unhealthy eyeballs.

Of the entire seventy only nine were in perfect condition. Ten were affected in one point; eighteen in two; sixteen in three; eleven in four; five in five and one in seven.

Is this the condition in your school?

If it is, how can we be "at ease in Zion" while we know that our children are rendering themselves only 50 per cent efficient and are suffering and dying because of their and their parents' ignorance?

Let every Missouri teacher boost for the health crusade that is now being pushed by the state and nation. Statistics show that Massachusetts has by health instruction and regulation added fourteen years to the average length of life of her citizens.

WHY NOT MISSOURI?

MEASURING TEACHING BY THE AIMS.

Eighth Problem.—To make a simple statement of the McMurry-Earhart standards by which teaching efficiency is measured and to ascertain the emphasis placed on each by the student-teachers of the Training School.

Method of Investigation and Results.—Fifteen teachers were selected and each was observed during three fifty-minute periods. During these observations attention was directed entirely to the aim or character of the teaching and an effort was made to divide most of the time among the aims named below. It is granted that part of what was done could not be placed under any of these head-

ings. Such time was not included. During these three observations the fifteen teachers devoted the following amounts of time to each of the aims listed below:

Aim 1, finding specific purposes for what was learned, 10 min.
Aim 2, judging the worth of material and of statements, 260 min.
Aim 3, supplementing thought, 555 minutes.
Aim 4, memorizing, 25 minutes.
Aim 5, testing for knowledge, 330 minutes.
Aim 6, organization of thought, 110 minutes.
Aim 7, using or applying ideas, 110 minutes.
Aim 8, teaching pupils how to work, 115 minutes.

If these figures represent the approximate truth then we will agree that aims 1, 4, 6, 7 were insufficiently emphasized while aim 5 (here is the danger for all of us) was over emphasized. The attention given to aims 2, 3, 6, 7 and 8 is quite creditable. On the whole we believe the record is far above the average of the country.

SIT UP AND LOOK AT TEACHER.

Ninth Problem.—To point out how valuable it is for children to sit erect, look at the teacher, keep both feet on the floor, stand erect, and hold books correctly when studying. We often say that these things affect health but how do they affect school work?

Method of Investigation and Results.—Eighty-five students in the Training School were systematically observed, being graded eight different times, to determine the relation between the scholarship of these pupils and their physical attitude in school. They were carefully graded on the above points and ranked as I, II, III or IV. Then their total scholarship records were compiled and compared with their ranking on "Physical Attitude." Here again, other determining factors are not considered.

Here are the results: In physical attitude 24 ranked I; 40 ranked II; 16 ranked III; and 5 ranked IV. Of the 24 I's in physical attitude, 16 were I in scholarship; 7 were II; 1 was III and 0 were IV. Of the 40 II's in physical attitude, 2 ranked I in scholarship; 35 ranked II; 3 ranked III and 0 ranked IV. Of the 16 who ranked III in physical attitude 0 ranked I in scholarship; 6 ranked II; 7 ranked III and 3 ranked IV. Of the 5 who ranked IV in physical attitude 0 ranked I in scholarship; 0 ranked II; 3 ranked III and 2 ranked IV.

Computing the probability from the above figures we find that a child who is careful about his physical attitude has a "3 to 1" chance of making a high grade in school, while carelessness in physical attitude gives him a "12 to 1" chance of making a low or failing grade in his studies.

Moral.—Look out for the physical attitude of your children.

SOME WORK IN GRAPHS AS PRESENTED IN THE TRAINING SCHOOL, ELEANORA HARRIS, A. M.

In the increasing list of experiments in the reorganization of Junior and Senior High School curricula are included careful investigations of the content of mathematics courses. Two factors affecting the selection of a course of study are the demands for its content as a tool for most effective work in school subjects and other activities of the pupils; and the relationship of its material to adequate preparation for adult activities. In mathematics there is now a tendency to stress applications. It is pretty well recognized that practical work in mathematics must include, among other things, the cultivation of the ability and the habit of observing, reading and interpreting graphs and the making of simple ones. Since the graph is relatively a new device in secondary mathematics great variation in its treatment exists. The purpose of this article is to show how some features of graphic work are being developed in actual practice in our Training School Junior and Senior High Schools.

Two things determine our method of treatment of graphs. First, the fact that the graph is a *tool.* Second, the belief that there must be training in *use* of the graph in situations familiar to the pupils and related to adult activities in order to insure that the graph will function in later school life and in adult life.

Work in graphs is distributed throughout the mathematics courses in connection with the treatment of the various topics and is not an end in itself.

Pupils are encouraged to make a collection of graphs illustrating advertisements and catalogues and articles in newspapers and magazines. The pupils discuss these graphs and criticise them both favorably and unfavorably. Many such graphs are sources of valuable information that may be used in their school work. Such study of graphs enables pupils to select the form of graph suited to represent data they collect.

Training is given in recognizing and securing definite and measurable data from the various school subjects and other fields of child and adult work and recreation. There is training in classifying and tabulating data according to definite plans in order to make possible actual practice in effective, economical and accurate graphing of the figures secured by the pupils.

The graphs illustrating this article mainly represent sets of unrelated quantities, such as number of pupils in the different classes, Figure 1. Functional graphs and the use of graphs in the solution of equations are stressed particularly from the ninth grade on. They are not emphasized here because they receive most attention in text books commonly used in the schools. The graphs shown have been selected as fair representatives of some standard methods which are used by our pupils and their student teachers.

In the interest of economy of time and energy needed for the making of graphs, of ease in handling and of interpreting graphs, and of training in use of business methods, our graphs are usually plotted on co-ordinate paper, 8½-inch by 11-inch in size. Cross section paper with strong dark colored lines is used if it is desired that the co-ordinate lines show plainly, as in Figures 1, 2, 3 and 4. If it is not desirable that the co-ordinate lines show plainly, paper with faint blue lines is selected.

Lettering for graphs is done on the typewriter or by hand. Whenever practical the lettering is placed in the margin and not in the ruled field. The amount of lettering needed in order to make the meaning of the graph clear to the reader is an important factor in the selection of suitable forms of graphs to be used in representing sets of data.

In order to illustrate our actual practice in graphic work and to avoid giving detailed technique, photographs of some graphs made by pupils are given here. Small areas were not ruled by hand to suit exactly each set of data as is often done for illustration of magazine articles. A few of the faint blue printed vertical co-ordinate lines were retraced in black ink in the making of the graph shown in Figure 7.

Single dimension illustrations, or bars, are best for simple comparison of size. The use of this graphic device is illustrated in the first eight figures. The order of arrangement is usually according to *size* of items, the largest to the left as in Figures 1 and 3; or at the top as in Figures 4, 6 and 7. In Figure 5 the order is according to *desirability* of the items. For the same reason our scores were represented before those of the opponent in Figure 2. The *sequence of the items in time* determined the order of the pairs of bars in Figures 2 and 8.

Because of the comparatively large number of items compared, Maxime Duckwell, Grade 7, used heavy lines instead of bars in picturing comparison of size of mathematics classes, Figure 1. She made her own selection of scale units and in her discussion of the graph gave her reasons.

Color conventions for chart work are observed by Fred Brokaw, Grade 7, in his graph, Figure 2. Red, a danger signal is used in representing the scores of the opposing team. Green is used to represent the scores our team made, desirable scores. Pupils enjoy making this graph and they take great interest in seeing it grow as new scores are added from time to time. The scores shown by Fred are for games played up to December 1. His use of grouped bars admits of different comparisons. For each game the scores of the two teams are easily compared; and the scores made by either team may be compared for the series of games. Figure 8 shows a similar use of grouped bars.

The twenty pupils in Arithmetic 7c made graphs showing growth in weight of the boys and girls of the class. They used colored

heavy lines in the same manner that Fred used bars in his graph. The multiplicity of lines caused confusion. As shown in Figure 3, Jean Scott used outline bars to represent the weights of the girls of the class October 23 and heavy black lines were drawn through the center of the bars to show weight in November. In her graph normal weights are denoted by horizontal broken lines drawn across the bars. Jean's arrangement is economical of space and clearly represents the facts. For instance, it is clear that H. K. was under normal weight when weighed in October and that she weighed less in November than in October.

The horizontal arrangement of bars in Figure 4 is especially appropriate for representing the data graphed by Eugene DesCombes, Grade 8. The actual figures would have been placed at the left of the bar as in Figures 5, 6 and 8, had the width of margin on the cross-section paper available permitted it. Comparison of the two component parts with each other and with the whole is easily made since the decimal points are in line and the calculations may be made easily.

Mary Harper, Grade 10, pictures comparison of component parts in two ways in Figure 5. As noted above, desirability of items determined her order of arrangement of bars. Since the items are few in number, perhaps comparison can be made as easily as if the bars were arranged in order of size of items. For a large numbe of items, arrangement according to order of size is better. Sector graphs are much used for representing comparison of parts with the whole. This form of graph is good when percentages are used. For actual numbers the bars are preferable. Mary might have shown a bar to represent the total, as was done in Figure 6. However, she did not do so as the total number of marks was not the thing she wished to bring out particularly. The relative number of marks denoting excess, normal or diminished credit, is the thing she wished to show. She rightly includes exact figures in her graph. For a large number of sectors the percentages should be placed without the circle to avoid difficulty in making comparisons.

An exceedingly useful standard method of comparison of component parts is used in Figure 6 by Frances Krohn in the graphing of data relating to the school garden, work of the class in Agriculture, Grade 11. The arrangement of "eye-catchers," name of items, actual figures and bars is good. The "eye-catcher" feature may often be obtained by the use of pictures cut from catalogues and pasted in the graph. Not many pupils can draw them well. Neat cross hatching is also difficult. One pupil graphed the same data using colors, yellow, blue, brown and black. These colors were used because, according to color conventions in chart work, they denote neither favorableness nor unfavorableness of features pictured. The colors were used in the order named, running from light to dark, in order to avoid optical illusion. The upper bar denoting the total profit did not appear constricted at any point. The colors brought

out the facts perhaps better than does the cross hatching used by Frances. They make a graph attractive and are economical of time. On account of cost in printing it is not practical to show the graph in which colors appear. In general, black and white are all that are needed in graphic work. Colors may be used occasionally.

Geography, general science and many other school subjects, as well as agriculture, furnish data suitable to the method used in Figure 6. It is a popular form, and is easily made and interpreted.

The right-and-left arrangement of bars used in Figure 7 by Jerome Andes is convenient for use in picturing rank of items. The data were secured by the Commercial Geography class of which Jerome is a member. The right-and-left arrangement makes comparison of size somewhat difficult. However, since the rank of the items and not the actual size is being compared, and since the actual figures are given, the method is appropriate. The same method might be used to show rank of business items ranked according to profit and loss, or receipts and expenditures. In agriculture the *amount* of crops raised for different years might be shown on one side and the *value* of the crops for the same years shown on the other side. In October the bureau of immigration issued a "table of races" showing increase and decrease in population for 1920 up to July 1. Part of these data was graphed by the method used by Jerome.

One day our superintendent remarked "I wonder if our Training School appeals to boys as well as to girls?" In response, data was collected and a graph made by Genevieve Mohler, Grade 11. Figure 8 shows that the contrast between increase and decrease in enrollment of boys and girls in the different grades is well brought out by the right-and-left arrangement of bars as used by her. This form of graph is easily made and interpreted and may well be used in graphing many sets of data. The use of arrows pointing to the right and to the left to bring out the fact that the zero line is not at the left-hand edge of the graph is to be noted. The placing of the actual figures between the title for each item and the end of the bar conforms to the standard arrangement for data for hortizonal bar comparison.

Some uses of the straight-line graph or the so-called "curve" are illustrated in Figures 9, 10, 11 and 12. Pupils in the seventh grade can easily make and understand simple graphs of this sort. Such work is good preparation for the plotting of curves in the ninth grade in connection with equations and problem-solving. In general, intervals of time or independent variables should be shown along the horizontal axis and dependent variables along the vertical axis.

Some of the pupils in Arithmetic, Grade 8b, thought that the thermostat in their room was not registering properly. A thermometer was secured from the college science department and readings were made for several days by the pupils and checked by their student teacher. Mary Ellen Aber, a member of the class, graphed the readings, Figure 9.

The Freshmen watch their report cards carefully. Lawrence Lee Bethel graphed the Marks he made. He claims that it helped him keep up his grades. Figure 10 shows that he did beat his past record several times.

A frequency distribution is displayed in Figure 11, by Elizabeth Lunn, Grade 10. Such distributions may also be shown by the vertical bar form. In the use of either method the frequencies are showing along the vertical axis.

Marjorie Barnett, a student teacher, used the Rugg-Clark Standardized Practice Exercises in connection with the algebra work her class was doing. She made graphs of the scores made. For Set No. 2 Figure 12 shows the attainment of her class from first trial to fifth trial. The first trial only 20 per cent of the class reached the standard score for "rights" which is 12 problems in five minutes. The fifth trial 80 per cent of the class solved 12 or more problems correctly. This year we are trying out these Practice Exercises very carefully and hope to have some very interesting data by the end of the school year.

Graphs of the character of those shown in Figures 10, 11 and 12 are well worth while for teachers to make. It is one method of checking up the results they are obtaining in their teaching work.

The discussion of graphs as treated in our Training School High Schools, Grades 7 to 12, inclusive, may be summarized thus:

1. Pupils study graphs taken from newspapers and other sources.
2. Statistical material is collected, tabulated and graphed.
3. There is much graphing of concrete data secured from various kinds of school and adult work and recreations.
4. Most of the work of graphing equations and solving of problems by the use of graphs is done from the ninth year on.
5. Training in graphic expression is continued throughout the mathematics courses of the various years.
6. There is an attempt to use standard methods as determined by best usage.
7. The graph is a tool. Therefore, in their efforts to train the pupils to use graphs intelligently and profitably, the teachers try to observe the principles governing economical and efficient use of tools.

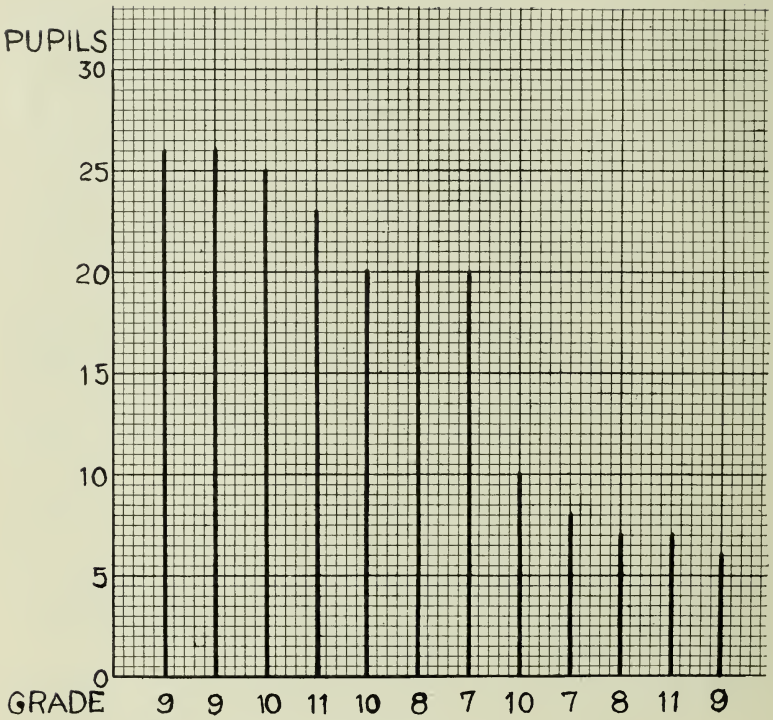


FIGURE 1.

SIZE OF MATHEMATICS CLASSES, FALL, 1920.

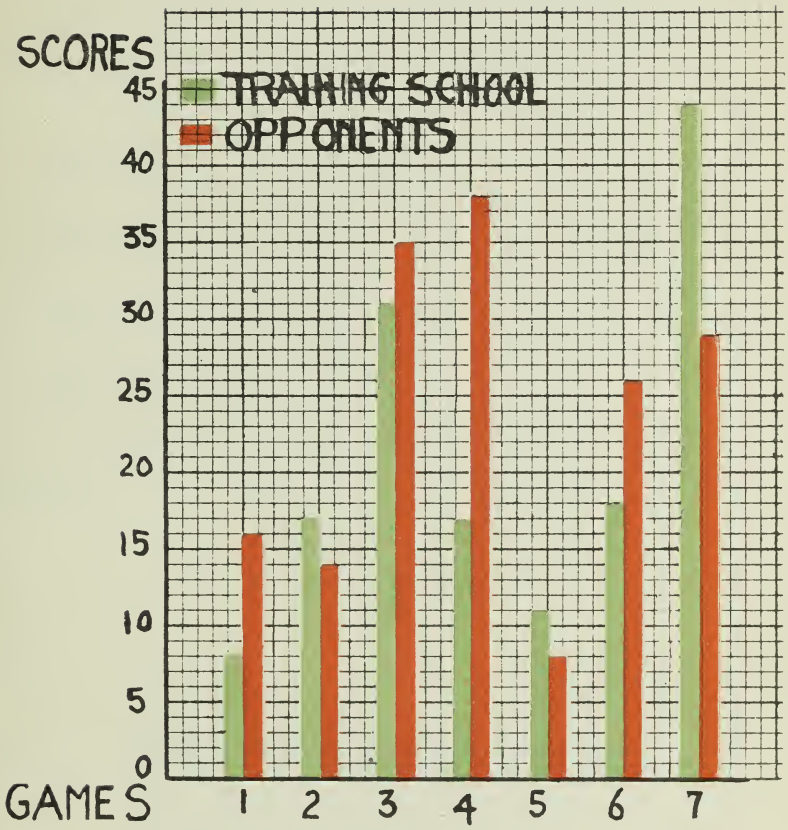
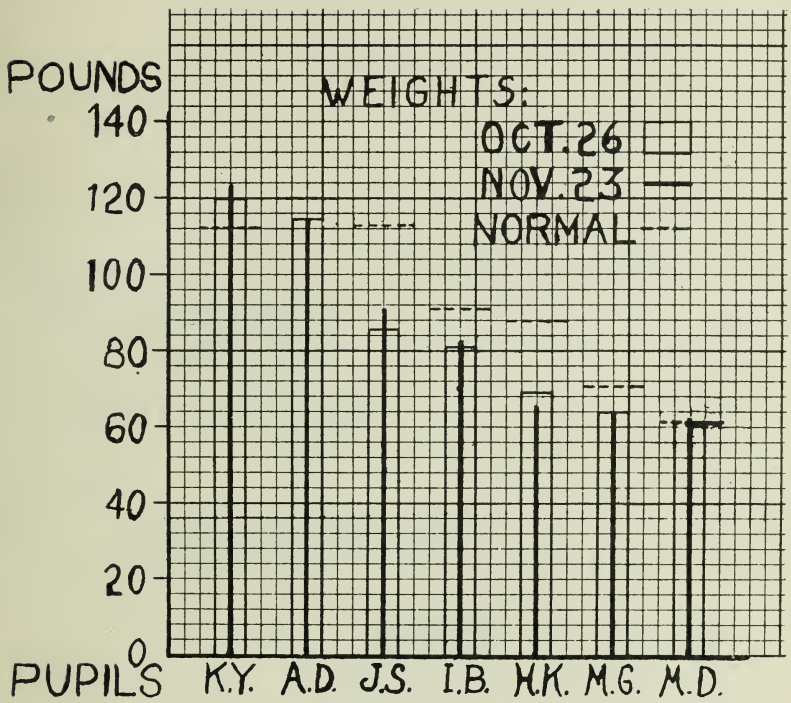


FIGURE 2.

BASKET BALL RECORD, 1920.



FIGRUE 3.

GROWTH OF GIRLS.

GRADE 7 C.

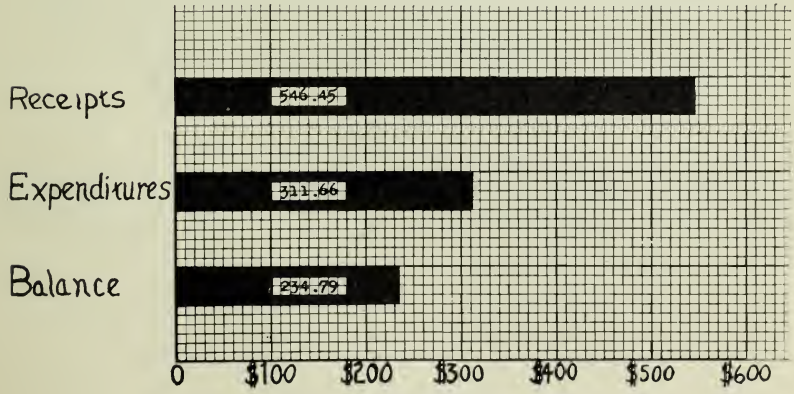
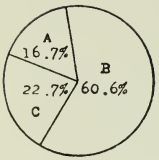


FIGURE 4.

STUDENT ACTIVITES ACCOUNT.

APRIL 1, 1919—DECEMBER 1, 1920.



A. Excess Credit - - - 33 or 16.7% 33

B. Normal Credit - - - 120 or 60.6% 120

C. Diminished Credit - - 45 or 22.7% 45

Figure 5. Two methods of showing distribution of 198 Term Marks giving "credit for quality" for work done in Mathematics in the Training School Junior and Senior High Schools. Fall Term, 1920.

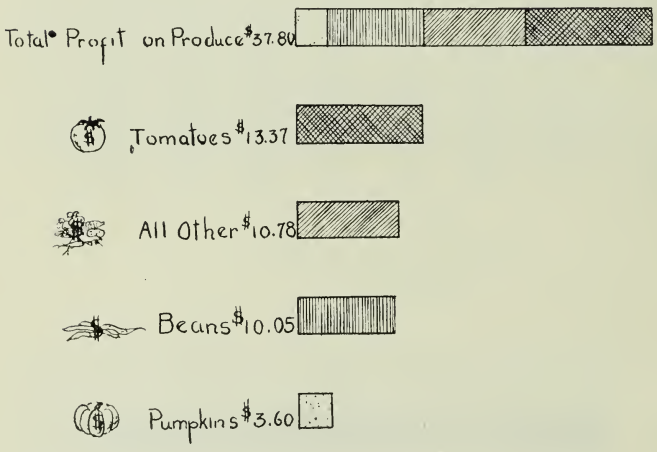


Figure 6. The Training School Garden Profits-1920-

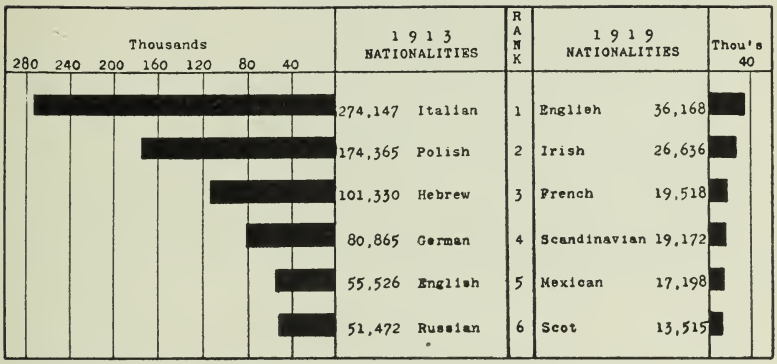


Figure 7. The "Older" and the "Newer" American Immigrants.

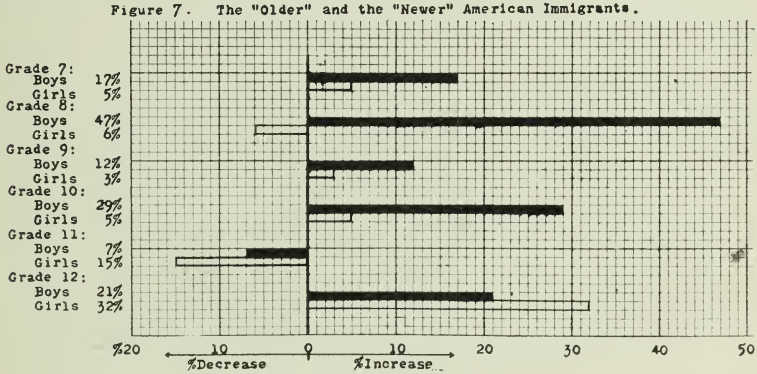


FIGURE 8.

GROWTH OF TRAINING SCHOOL JUNIOR AND SENIOR HIGH SCHOOLS. PERCENTAGES FOR BOYS AND FOR GIRLS CALCULATED SEPARATELY FOR FALL TERM, 1920, OVER FALL TERM, 1919.

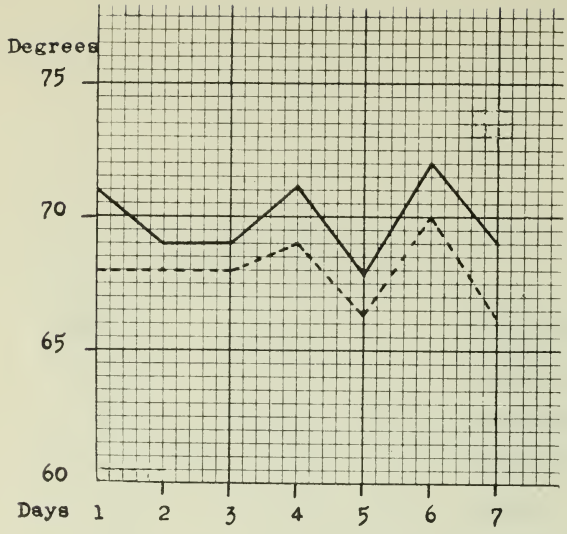


FIGURE 9.

Comparison of Thermometer (full-drawn line) and Thermostat (broken line) readings for seven days at Period IV, Room 304B, Training School. November, 1920.

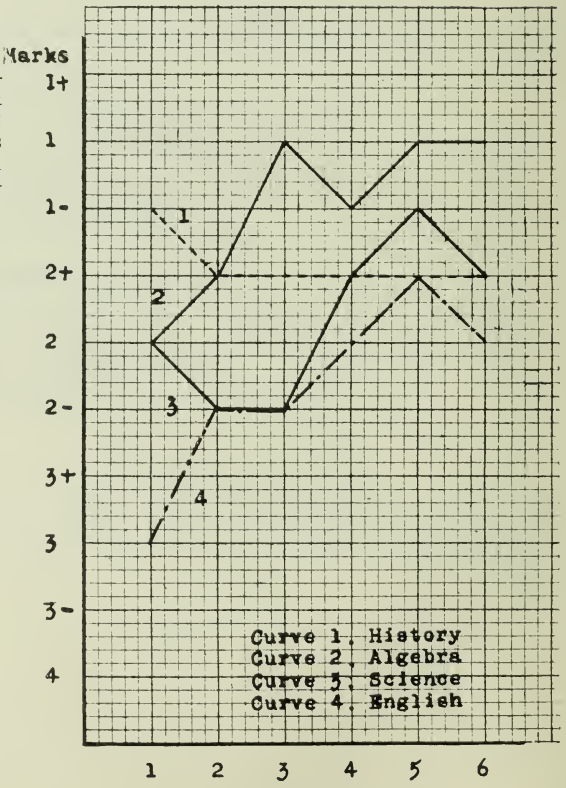


FIGURE 10.

A Comparison of marks made by Lawrence Lee Bethel, Grade 9. Fall Term, 1920.

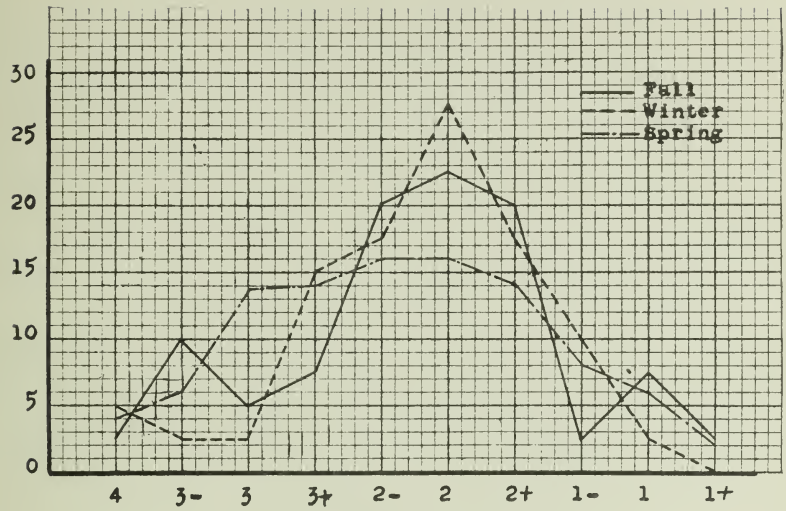


FIGURE 11.

Distribution of Geometry Marks, 1919-20. The Mark made is shown along the horizontal axis. The percentage of the 40 pupils making each mark is shown along the vertical axis.

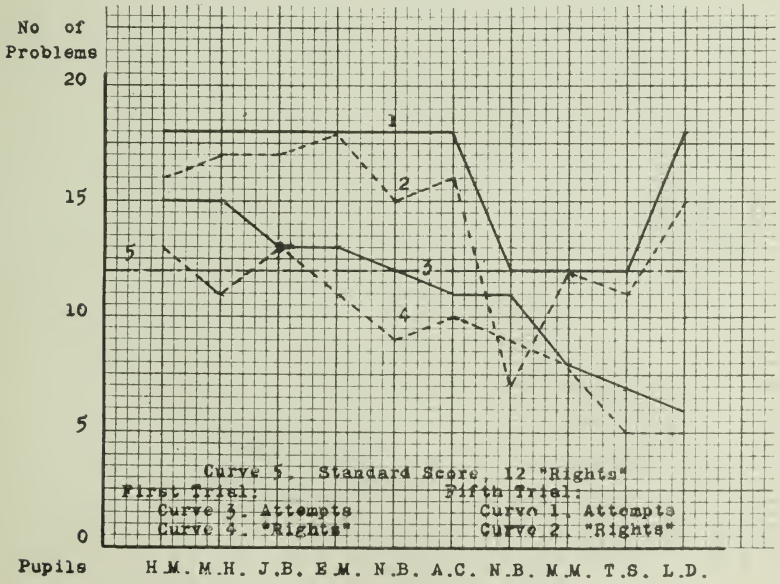


FIGURE 12.

Comparison of scores made by 10 pupils solving the problems in the Rugg-Clark Standardized Practice Exercises, Set No. 2, Simple Equations.